

Christopher J. D. POMFRETT, *et al.*
Serial No. 10/553,745
February 11, 2011

AMENDMENTS TO THE CLAIMS:

The following listing of claims supersedes all prior versions and listings of claims in this application:

1-21. (Cancelled)

22. (Currently Amended) A method for monitoring the response of a nervous system of a body to a sensory stimulus, said method comprising:

providing a plurality of electrodes on a surface of the body and passing current between selected areas of the surface of the body by passing current between at least one pair of electrodes of said plurality of electrodes, said current being provided by a current source external to said body; [[and]]

collecting a set of voltage measurements between selected ones of said plurality of electrodes while said current is passing between said at least one pair of electrodes;

comparing wherein the set of voltage measurements is collected over a predetermined measurement period, the predetermined measurement period that begins only is initiated after a predetermined time delay that is determined so as to monitor for a physiological response of a specific part of the nervous system based upon a neurological model following occurrence of the sensory stimulus, and the

Christopher J. D. POMFRETT, *et al.*
Serial No. 10/553,745
February 11, 2011

~~collected voltage measurements are compared~~ with reference measurements to determine normal or abnormal response of said specific part of the nervous system; and
outputting a result of said comparison.

23. (Currently Amended) A method according to claim 22, wherein the set of voltage measurements collected over said measurement period is used to produce an image representing the distribution of impedance within the body.

24. (Previously Presented) A method for monitoring the response of a nervous system of a body to a sensory stimulus, said method comprising:

providing a plurality of electrodes on a surface of the body and passing current between selected areas of the surface of the body by passing current between at least one pair of electrodes of said plurality of electrodes, said current being provided by a current source external to said body; and

collecting a set of voltage measurements between selected ones of said plurality of electrodes while said current is passing between said at least one pair of electrodes;

wherein the set of voltage measurements is collected over a predetermined measurement period, the predetermined measurement period is initiated after a predetermined delay based upon a neurological model following occurrence of the

sensory stimulus, and the collected voltage measurements are compared with reference measurements to determine normal or abnormal response of the nervous system,

the sensory stimulus comprises a series of second stimuli,

a set of voltage measurements is collected during current injection periods initiated after application of each second stimulus, the collection of voltage measurements related to each second stimulus is initiated at a time delay relative to the respective second stimulus, and

the time delay differs for each second stimulus, and differences between collected sets of voltage measurements are interpreted as representing changes in nervous system activity over the time difference between the respective time delays.

25. (Previously Presented) A method according to claim 24, wherein each set of voltage measurements is used to produce a respectively corresponding image representing the distribution of impedance within the body and the thus produced images are compared with each other to identify changes in nervous system activity.

26. (Previously Presented) A method according to claim 22, wherein the applied sensory stimulus is a visual or an auditory stimulus.

Christopher J. D. POMFRETT, *et al.*
Serial No. 10/553,745
February 11, 2011

27. (Previously Presented) A method according to claim 22, wherein measured voltage measurements are filtered using a Kalman filter.

28. (Previously Presented) A method according to claim 22, further comprising applying the sensory stimulus.

29. (Currently Amended) A method according to claim 22, wherein when application of the sensory stimulus is detected, said detection starts measurement of said ~~predetermined~~ time delay.

30. (Previously Presented) A method according to claim 29, wherein the sensory stimulus occurs spontaneously.

31. (Previously Presented) A method according to claim 30, wherein the sensory stimulus is a feature of an environment in which the body is located.

32. (Currently Amended) A method for monitoring the response of a predetermined part of a nervous system of a body to an applied sensory stimulus, said method comprising:

identifying a ~~[[the]]~~ predetermined part of a ~~[[the]]~~ nervous system of a body;
providing a plurality of electrodes on a surface of the body and passing current between selected areas on ~~[[of]]~~ the surface of the body and selected regions therewithin corresponding to a predetermined part of the nervous system by passing current between at least one pair of electrodes of said plurality of electrodes, said current being provided by a current source external to said body; and

collecting a set of voltage measurements between selected ones of said electrodes while said current is being passed between said at least one pair of electrodes;

wherein the set of voltage measurements is collected over a predetermined measurement period, ~~the predetermined measurement period is initiated~~ which begins after a ~~predetermined~~ time delay following occurrence of the applied sensory stimulus, and said ~~predetermined~~ time delay is selected so as to monitor for a physiological response of a specific part of the nervous system based on the basis of (a) a neurological model of the nervous system and (b) the predetermined part of the nervous system for which a response is monitored; and

outputting a result based on said set of voltage measurements.

33. (Previously Presented) A method according to claim 32, wherein the collected voltage measurements are compared with reference measurements to determine normal or abnormal response of the nervous system.

34. (Previously Presented) A method according to claim 32, wherein the sensory stimulus is a visual or auditory stimulus.

35. (Currently Amended) A method according to claim 32, wherein said regions and/or areas on the basis of a neurological model of the nervous system and the applied sensory stimulus such that sensitivity of the derived impedance measurements to changes in the predetermined part of the nervous system is ~~maximized~~ enhanced.

36. (Currently Amended) An apparatus for monitoring the response of a nervous system of a body to an applied sensory stimulus, said apparatus comprising:

means for applying a ~~[[the]]~~ sensory stimulus to a ~~[[the]]~~ body;

means for collecting a set of voltage measurements between selected ~~ones of~~ said electrodes in contact with said body while electrical ~~[[said]]~~ current is being passed from an external source between other ~~said at least one pair of~~ electrodes in contact with said body,

Christopher J. D. POMFRETT, *et al.*
Serial No. 10/553,745
February 11, 2011

wherein the set of voltage measurements is collected over a ~~predetermined~~ measurement period, ~~the predetermined measurement period is initiated~~ which begins after a ~~predetermined~~ time delay that is determined so as to monitor for a physiological response of a specific part of the nervous system based upon a neurological model following occurrence of the sensory stimulus, ~~[[and]]~~

means to compare the collected voltage measurements with reference measurements to determine normal or abnormal response of said specific part of the nervous system, and

means for outputting a result of said comparison.

37. (Currently Amended) An apparatus for monitoring the response of a predetermined part of a nervous system of a body to an applied sensory stimulus techniques, said apparatus comprising:

a plurality of electrodes for attaching to a surface of the body, said plurality of electrodes being arranged to pass current between selected areas on the surface of the body by passing current between at least one pair of electrodes of said plurality of electrodes, said current being provided by a current source external to said body;

means for applying a ~~[[the]]~~ sensory stimulus to said body, ~~[[and]]~~

means for collecting a set of voltage measurements between selected ones of said electrodes while said current is being passed between other of said ~~at least one~~ pair of electrodes,

wherein the set of voltage measurements is collected over a ~~predetermined measurement period~~, the ~~predetermined measurement period~~ that begins is initiated after a ~~predetermined~~ time delay following occurrence of the sensory stimulus, and said ~~predetermined time~~ delay is selected so as to monitor for a physiological response of a specific part of the nervous system based on the basis of (a) a neurological model of the nervous system and (b) the predetermined part of the nervous system for which a response is monitored, and

outputting a result based on the collected voltage measurements.

38. (Currently Amended) A method of diagnosing a brain dysfunction, said method comprising:

providing a plurality of electrodes on a surface of a patient's head and passing current between selected areas of the surface of the body by passing current between at least one pair of electrodes of said plurality of electrodes, said current being provided by a current source external to said body;

applying a sensory stimulus to a patient; and

Christopher J. D. POMFRETT, *et al.*
Serial No. 10/553,745
February 11, 2011

collecting a set of voltage measurements between selected ones of said electrodes while said current is being passed between said at least one pair of electrodes;

wherein the set of voltage measurements is collected over a predetermined measurement period, the predetermined measurement period that begins after a time is initiated at a predetermined delay which is determined so as to monitor for a physiological response of a specific part of the nervous system based upon a neurological model following occurrence of the sensory stimulus, ~~[[and]]~~

comparing the collected voltage measurements ~~are compared~~ with reference measurements to determine normal or abnormal response of said specific part of the nervous system, and

outputting a result based on said comparison.

39. (Currently Amended) A non-transient computer-readable computer program storage medium containing computer program code which, when executed by a computer effects a procedure in accordance with the method of claim 22.

40. (Previously Presented) A computer apparatus comprising:
a memory storing processor readable instructions;

a processor for reading and executing instructions from said memory;
wherein said memory comprises instructions which, when executed, cause the processor to execute the method of claim 22.

41. (Currently Amended) A method for monitoring the response of a nervous system of a body to a sensory stimulus, said method comprising:

providing a plurality of electrodes on a surface of a ~~[[the]]~~ body and passing current between selected areas of the surface of the body by passing current between at least one pair of electrodes of said plurality of electrodes, said current being provided by a current source external to said body;

collecting a set of voltage measurements between selected ones of said electrodes while said current is passed between said at least one pair of electrodes;

wherein the set of voltage measurements is collected over a ~~predetermined~~ measurement period, user input determining ~~indicating~~ a time delay after which the ~~is received and the predetermined~~ measurement period is initiated so as to monitor for a physiological response of a specific part of the nervous system after a predetermined ~~delay based upon the input time delay~~ following occurrence of the sensory stimulus,
[[and]]

Christopher J. D. POMFRETT, *et al.*
Serial No. 10/553,745
February 11, 2011

comparing the collected voltage measurements ~~are compared~~ with reference measurements to determine neurological behavior of said specific part of the nervous system, and
outputting a result based on said comparison.

42. (Currently Amended) A method for monitoring the response of a nervous system of a body to a sensory stimulus, said method comprising:

providing a plurality of electrodes on a surface of a ~~[[the]]~~ body and passing current between selected areas of the surface of the body by passing current between at least one pair of electrodes of said plurality of electrodes, said current being provided by a current source external to said body;

collecting a set of voltage measurements between selected ones of said electrodes while said current is passed between said at least one pair of electrodes,

wherein the set of voltage measurements is collected over a ~~predetermined measurement period, the predetermined measurement period~~ which begins is initiated after a ~~predetermined time~~ delay that is determined so as to monitor for a physiological response of a specific part of the nervous system based upon a neurological model following occurrence of the sensory stimulus, ~~[[and]]~~

Christopher J. D. POMFRETT, *et al.*
Serial No. 10/553,745
February 11, 2011

comparing the collected voltage measurements ~~are compared~~ with reference measurements to determine neurological behavior of said specific part of the nervous system, and

outputting a result based on said comparison.

43. (Currently Amended) A method for monitoring nervous system response to a sensory stimulus, said method comprising:

(a) applying a predetermined sensory stimulus to a nervous system of a living subject;

(b) after an initial time delay, injecting electrical current through at least a first pair of electrodes affixed to the head of said subject for a first current injection time period;

(c) during said first current injection time period, measuring electrical voltage between further pairs of electrodes also affixed to the head of said subject;

(d) subsequent to said first current injection time period, again injecting electrical current through at least another pair of said electrodes for another current injection time period;

(e) during said another current injection time period, measuring electrical voltages across other pairs of said electrodes;

Christopher J. D. POMFRETT, *et al.*
Serial No. 10/553,745
February 11, 2011

- (f) repeating steps (d) and (e) a predetermined number of times;
- (g) creating an image of brain activity in said subject based on said measured electrical voltages; [[and]]
- (h) repeating steps (a)-(g) for different initial time delays so as to monitor for physiological responses of specific respectively corresponding different parts of the nervous system to derive a time sequence of images revealing nervous system responses to said predetermined sensory stimulus in said corresponding different parts of the subject's brain; and
- (i) outputting said sequence of images to a display.

44. (Currently Amended) A method for monitoring the response of a predetermined part of a subject's brain to an applied sensory stimulus, the method comprising:

identifying a predetermined part of a brain to be monitored for a response to an applied sensory stimulus;

providing a plurality of electrodes on a surface of a subject's head and passing current between selected areas of the surface of the head by passing current between at least one pair of electrodes of said plurality of electrodes, said current being provided by a current source external to said subject; [[and]]

Christopher J. D. POMFRETT, *et al.*
Serial No. 10/553,745
February 11, 2011

collecting a set of voltage measurements between selected ones of said electrodes while said current is being passed between said at least one pair of electrodes;

wherein the set of voltage measurements is collected over a ~~predetermined measurement period, the predetermined measurement period~~ which begins is initiated after a ~~predetermined~~ time delay following occurrence of the applied sensory stimulus, and said ~~predetermined~~ time delay is selected so as to monitor for a physiological response of a specific part of the nervous system based on the basis of (a) a neurological model of the brain and (b) the identified predetermined part of the brain for which a response is monitored; and

outputting a result based on said set of voltage measurements.

45. (Currently Amended) A method for monitoring the response of a nervous system of a body to a sensory stimulus, the method comprising:

providing a plurality of electrodes on a surface of the body and passing current between selected areas of the surface of the body by passing current between at least one pair of electrodes of said plurality of electrodes, said current being provided by a current source external to said body; and

Christopher J. D. POMFRETT, *et al.*
Serial No. 10/553,745
February 11, 2011

collecting a set of voltage measurements between selected ones of said plurality of electrodes while said current is passing between said at least one pair of electrodes;

wherein the set of voltage measurements is collected over a ~~predetermined measurement period, the predetermined measurement period~~ which begins is initiated after a ~~predetermined time~~ delay following occurrence of the sensory stimulus, the ~~predetermined time~~ delay being determined so as to monitor for a physiological response of a specific part of the nervous system based upon a neurological model with no measurements being collected during said ~~predetermined time~~ delay, ~~[[and]]~~

comparing the collected voltage measurements ~~are compared~~ with reference measurements to determine normal or abnormal response of said specific part of the nervous system; and

outputting a result based on said comparison.

46. (Currently Amended) A method for monitoring the response of the lateral geniculate nucleus (LGN) of a subject's brain to an applied sensory stimulus, the method comprising:

providing a plurality of electrodes on a surface of the subject's head and passing current between selected areas of the surface of the head by passing current between

Christopher J. D. POMFRETT, *et al.*
Serial No. 10/553,745
February 11, 2011

at least one pair of electrodes of said plurality of electrodes, said current being provided by a current source external to said subject; and

collecting a set of voltage measurements between selected ones of said electrodes while said current is being passed between said at least one pair of electrodes;

wherein the set of voltage measurements is collected over a ~~predetermined measurement period~~, the predetermined measurement period which begins is initiated after a ~~predetermined~~ time delay following occurrence of the applied sensory stimulus, and said ~~predetermined~~ time delay is selected so as to monitor for a physiological response of a specific part of the nervous system based on ~~the basis of~~ a neurological model of the brain which models activity of the lateral geniculate nucleus.

47. (New) A method comprising:

(a) applying or detecting the occurrence of a sensory stimulus to the nervous system of a living body;

(b) after a time delay from step (a), injecting electrical current from an external source to said nervous system through a surface of said body and concurrently collecting voltage measurements from the surface of said body, said time delay being selectively chosen so as to monitor for a physiological response of a specific part of the

nervous system based upon (i) a previously derived neurological model of said nervous system and (ii) a selected part of the nervous system for which a response is to be monitored; and

(c) outputting a result based on said collected voltage measurements.

48. (New) A method as in claim 47 wherein step (b) comprises an electrical impedance tomography (EIT) process which is triggered to begin after said time delay and wherein step (c) comprises display of at least one EIT image.

49. (New) Apparatus comprising:

(a) means for applying or detecting the occurrence of a sensory stimulus to the nervous system of a living body;

(b) means for establishing a time delay from step (a) and for thereafter injecting electrical current from an external source to said nervous system through a surface of said body and concurrently collecting voltage measurements from the surface of said body, said time delay being selectively chosen so as to monitor for a physiological response of a specific part of the nervous system based upon (i) a previously derived neurological model of said nervous system and (ii) a selected part of the nervous system for which a response is to be monitored; and

Christopher J. D. POMFRETT, *et al.*
Serial No. 10/553,745
February 11, 2011

(c) means for outputting a result based on said collected voltage measurements.

50. (New) Apparatus as in claim 49 wherein said means for establishing comprises means for performing an electrical impedance tomography (EIT) process which is triggered to begin after said time delay and wherein said means for outputting a display of at least one EIT image.